Washing museum textiles: what's the harm?

Other

WASHING MUSEUM TEXTILES: WHAT'S THE HARM?

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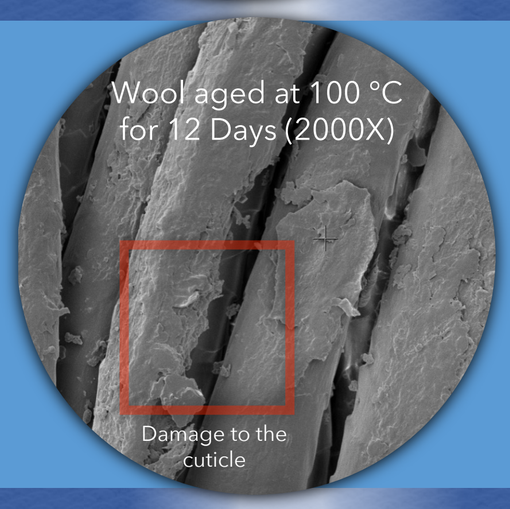
Textile conservators aim to prevent the deterioration of historical and irreplaceable textiles, they often use surfactants to remove potentially harmful soiling from the surface of these textiles. Surfactants are molecules which help to remove oily soils. It is unknown whether any surfactant is being adsorbed onto these textiles during the wet cleaning process used by conservators. This research aims to investigate this possible adsorption and its potentially damaging effects.

RESEARCH QUESTIONS

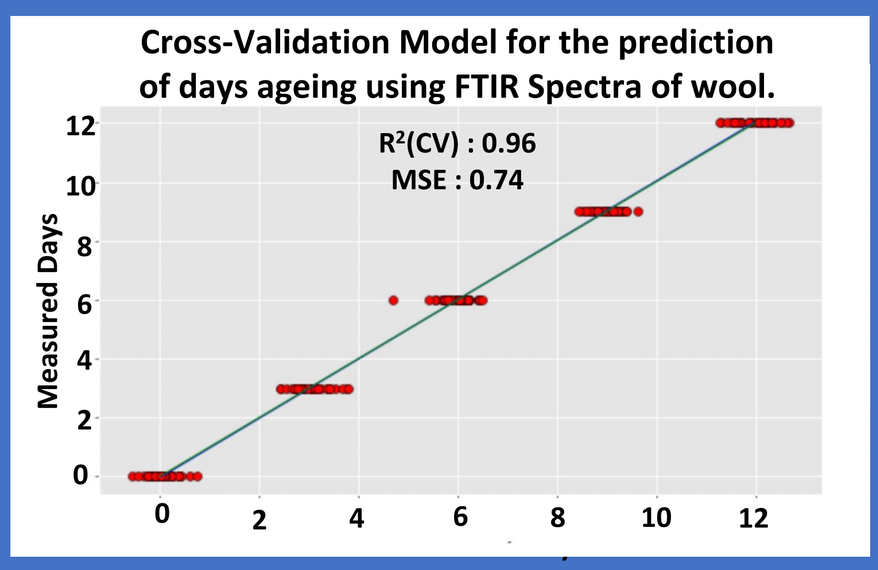
- Surfactants are known to adsorb onto surfaces, are they adsorbing onto irreplaceable museum textiles during washing?
- If so, are they damaging the textile?
- Is there any interference from natural fatty acids?

METHODS

1. Wool was artificially aged in an oven to be used as a model of museum textiles and then analysed by FTIR using multivariate analysis, SEM & contact angle measurements.
2. Aged wool samples were washed in either water, a non-ionic surfactant (Dehypon LS54) or an anionic surfactant (Hostapon TPHC).
3. Dynamic contact angles were measured for washed, unwashed and unaged samples to observe surface hydrophilicity. Alongside FTIR spectra.

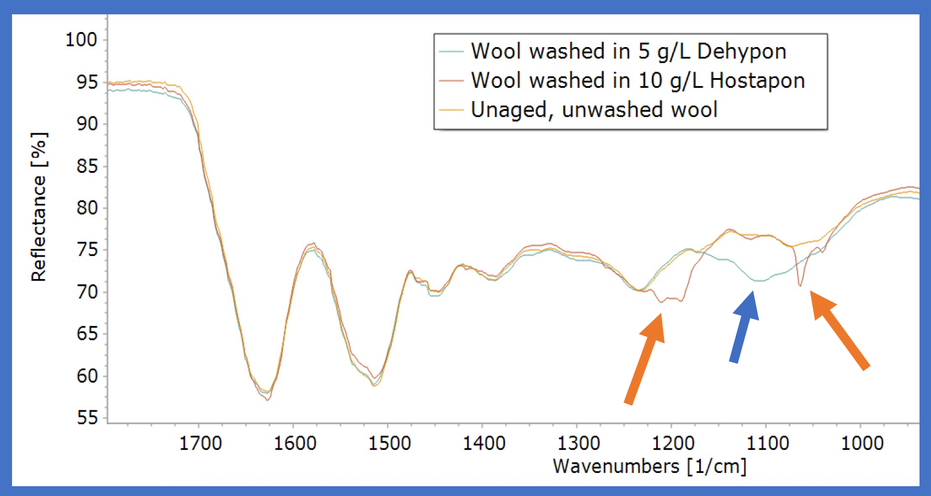


PRELIMINARY FINDINGS



- Aged wool was analysed by FTIR spectroscopy, a predictive model was created, which could be used later to predict the age of wool samples.
- Wool which was aged naturally on a window ledge for 40 days was put into the predictive model. The model suggested that 40 days natural ageing is equivalent to 10 days in an oven at 100°C.

- Wool washed in highly concentrated surfactant was analysed via FTIR spectroscopy. This showed peaks corresponding to surfactant (Hostapon – orange arrow; Dehypon – blue arrow.)
- For lower concentrations of surfactant, such as those used in museums, this method of analysis was unsuccessful.



- Dynamic contact angle measurements suggested that a contaminant was present when washing wool with water. It was thought to be a biocide present on the sponges used for cleaning.
- Further analysis of this biocide by 1H NMR, 13C NMR and LCMS suggested this to be a quaternary ammonium surfactant.

FUTURE WORK

- Textile conservators at the V&A have decided to wash sponges at 60 °C before use in hopes to remove the biocide discovered. This will be replicated in the laboratory to see if this is sufficient to remove the biocide.
- Extract washed woollen samples in solvent to see if any surfactant is adsorbed during the washing process.
- Use XPS to study changes in the surface chemical structure of washed & aged wool samples.
- Further replicates of dynamic contact angle measurements.